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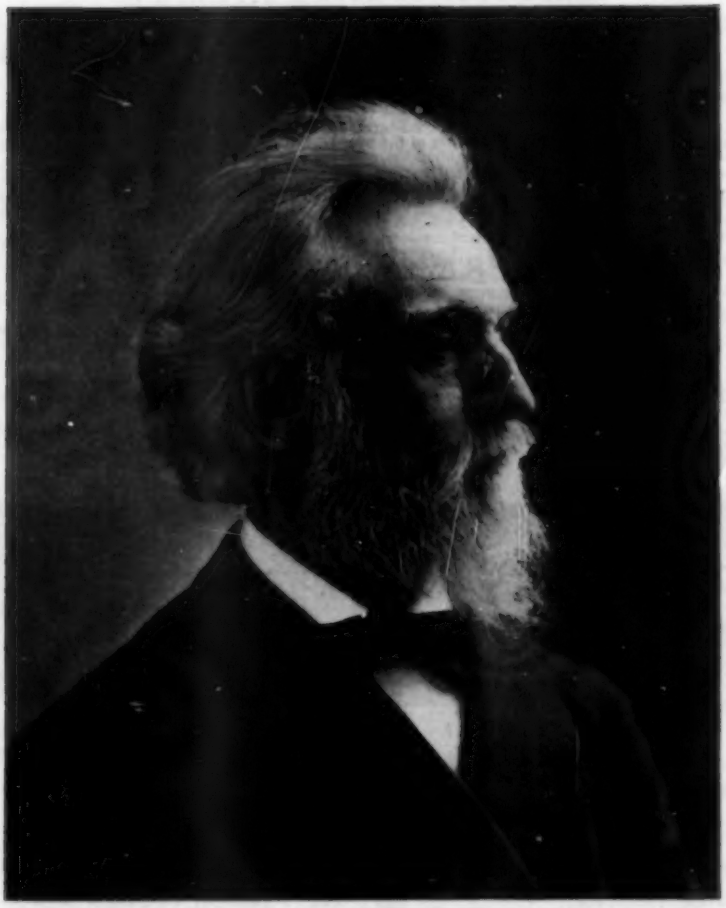

I. N. DANFORTH.

THE AMERICAN
X-RAY JOURNAL
Devoted to Practical X-Ray Work and Allied Arts and Sciences.

VOL. XV. CHICAGO, AUGUST, 1904. No. 2

The X-Ray in Renal Surgery.

BY I. N. DANFORTH, A. M., M. D., CHICAGO.

It is perhaps impossible to overestimate the value and importance of the x-ray in the diagnosis of the surgical diseases of the kidney, or, I should rather say, the differential diagnosis of these diseases, for the x-ray introduces a factor of certainty in place of uncertainty; a factor of exactness in place of inexactness; a factor of solidity and satisfaction in place of guess-work and doubt, and only those of us who practiced renal surgery before the x-ray was discovered can appreciate this. The younger surgeon can have no adequate conception of the darkness which surrounded the diagnosis of renal diseases requiring surgical interference before the advent of the Röntgen process. There is no superfluity of diagnostic illuminism yet; in fact, I have recently said in a paper published in another journal, that any operation on the kidney must be regarded as to a certain extent exploratory and diagnostic. Nevertheless, the Röntgen ray has the virtue of truthfully recording what it perceives, and then enables us to know what we are dealing with, or to know that we do *not* know, and that is infinitely better than stumbling along on conjecture merely. And this is particularly true in cases of suspected renal or ureteral calculus, which were formerly merely objects of lucky or unlucky guess-work, according to experience, skill or acumen of the guesser. Now, these elusive and sometimes provokingly self-contradictory bodies are forced to yield their secrets to the all-penetrating x-ray, and the surgeon can answer with a positive "yes" or "no," and feel that he is giving his patient an answer that he can rely upon. *Provided,* as the lawyers say in their ponderous documents, not written to be understood, *provided,* first, that the patient be properly prepared for examination, and especially that the gastro-intestinal tract be thoroly evacuated; and, *provided,* secondly, that the x-ray apparatus be handled by an expert and not by an amateur, and by an operator who does not jump at a conclusion from the indications of a single exposure only. The cause of skiagraphic diagnosis has suffered great injury at the hand of inexperienced and over-enthusiastic disciples whose zeal has outrun their judgment, and whose callow conclusions have often proved misleading and therefore exasperating. It does not contribute to a surgeon's growth in grace to be assured that a patient has a stone in his kidney, to have the x-ray proof triumphantly waved before his eyes, and then to operate with only negative results. But such results need not be if only proper care is taken and the results are verified by repeated exposures, until uniform findings ensue.

Birthmarks.

BY H. PERKINS FITZPATRICK, M. D., CHICAGO.

The above caption is intended to cover all the congenital disfigurements of either vascular or pigmentary origin. The vascular nevi may be arterial and red in color, or venous and dark blue or purplish in color. The pigmentary nevi may be of so many different types, depending as it does upon the structural involvements, that it will be necessary to classify them. The most pronounced types are the nevi pigmentosu, the nevi pigmentosu piloris, and verrucasus.

Lately I have fortunately had one or more of these angiomas under treatment, directly or thru others, who have kept me posted as to results of their treatment by my method of electrolysis.

One recent case, a very unsightly nevus pigmentosus piloris on the chin and portions of under lip, very deeply pigmented and thickly covered with a very profuse growth of stiff wiry hairs, I completely removed in three separate treatments. I am convinced now that it could have been done in less time had I not been extra cautious from fear of scarring. The young lady, being the daughter of Mr. B., one of our best policemen, and she herself being quite comely, I took special pains to give the best cosmetic results, even if at the expenditure of more time than at first intended. This growth was elevated about one-eighth of an inch above the surrounding skin, was very compact and hard and deeply pigmented; in fact, almost black. It was circular, and while perhaps somewhat larger, presented about the size of an impression on the skin made by a silver dollar. There was in excess of 400 hairs, every follicle seemingly having developed. During the first treatment I removed the hairs by electrolysis, using the same method as noted in previous articles in this JOURNAL. The inflammation from the destruction of the hairs being considerable, I deferred the actual removal of the growth for a few days until the inflammation subsided. In removing the growth I made numerous insertions thru it, my intention being to reduce it to a level with surrounding skin. The procedure was the same as in removing moles and all elevated growths, as previously described in this JOURNAL.

The ensuing crust formation came off in about a week and I found upon examination that the nevus had been reduced to a level with the skin except in a few isolated spots. There were still a few hairs remaining, and I soon removed them and leveled off the few raised places—during this third and final treatment. Examination quite recently shows practically perfect results.

Dr. McGavran, of Kansas City, Mo., wrote me some time last July respecting the treatment by electrolysis of the little girl Edna D—, whose picture we show herewith:

A few days ago I received from Dr. McGarvan another photo, also shown in this article, which illustrates better than words what patience, persistence and proper electro-surgical application will do for these nevi.

This was a difficult case to treat owing to the youth (10 years) and consequent restlessness and impatience of the child. The nevi extended around the outer angle of and into the nostril, as is clearly shown in the first photo. It required great tact and much time to cover so sensitive an organ so completely, while the lines of demarkation are clearly outlined

showing extent of the growth, its location and involvements and its structural appearance can not be understood until described. The surface covered was about 2x2½ inches. It was elevated, soft, fungus and warty. It was completely covered with large and fine hairs. The color was red and brown, and its appearance was decidedly repulsive.

This growth was thoroly treated by electrolysis twice, and in and around the nostrils three times. The treatment was similar to that described in previous case and the results show for themselves.

Having treated nearly every type of angioma, I have no hesitancy in asserting that there is none but can be permanently removed by electrolysis. The pigmentary nevi can be quickly removed and with perfectly cosmetic results. The vascular angiomas require numerous and frequent treatments, and owing to the extent of the capillaries in these growths and the length of treatment to remove them, the skin will be somewhat whiter than normal, owing to the destruction of tissue and loss of natural pigmentation through the eradication of all dermal capillaries.

My method of treatment for these abnormal defects is always by electrolysis.

I find the negative pole best for needle attachments in cases of pigmentary nevi.

For vascular angiomas a mixed treatment, using, first, a positive current and then following up with negative current is the most rapid, but no more effectual than the negative current alone. However, the positive pole, owing to its more rapid decomposition of tissue, and therefore greater possibilities of permanently

scarring the patient, is used only in exceptional cases where we are obliged to sacrifice cosmetic after-effects for the sake of securing quick results. From a financial standpoint this treatment is not much of a success. Unfortunately, most of those coming for treatment are poor—too poor to remunerate the physician for his labor. But there is a great satisfaction to know you can do this work, and a greater satisfaction to actually do it.

No set rule can be given as to amount of electricity to use—ordinarily it is advisable to begin with the minimum amount (say from 1 to 2 milliamperes) and gradually increase to point of tolerance. Best results in my cases have been met with by using from 3 to 5 milliamperes.

It is surprising how much more electricity one patient will endure than another. Therefore, owing to this idiosyncrasy of patients you will lose some of them before you can have an opportunity to demonstrate what your treatment will do unless you bear in mind that it is necessary to begin with a minimum current.

Psycho-Therapy.

BY SHELDON LEAVITT, M. D.

SUGGESTION CURES.

Outside the pages of a medical journal is seldom found so clear and concise a statement of a medical truth as that which follows:

That "all diseases are amenable to relief and cure" thru suggestion will be seriously questioned by nearly all. I take it that Dr. Corson intended to convey the idea that we can not set precise bounds to the curative action of suggestion in its various forms, without holding it to be an infallible cure. Quinine is a cure for intermittent fever, and is reckoned as a specific, and yet there are many cases of the disease which will not satisfactorily respond to it. Personally, I am not disposed to limit the curative action of suggestion to functional derangements of the organism, while, on the other hand, I do not contend that it will uniformly cure organic lesions. That it will sometimes do so I have demonstrated.

The philosophy of all cures wrought under the influence of Christian Science, Divine Science, Mental Science, and all the mind and faith cures, is absolutely explained. It has been found that these cures depend entirely upon suggestion. The explanation is simple and scientific. Any man or woman of ordinary intelligence and a common education can understand it. Not only so, but when properly understood and rightly applied in practice, by what we call Specific Suggestion, the management of all diseases heretofore treated by all mental or mind-cure methods is reduced to a positive science, and the results are marvelous. We assume that the law has been discovered by which the mind can be trained to control the bodily functions in health and disease, and that under this law, by suggestion, all diseases are amenable to relief and cure.

By suggestion in the treatment of disease we mean the presentation of thots to the mind of the patient in a manner and under conditions that will result in the functional and organic changes necessary to restore conditions of health.

That Christian Science, Divine Science, Mental Science, and other mental cure methods have relieved thousands of people nobody can deny. We should give them credit for all they have done, and for what they are still doing. But Specific Suggestion is always in advance of

all of these; it not only takes in all other methods of cure, but it simplifies them, and shows that they are all under the operation of one common, positive law, and that all people and all diseases can be reached and cured under this law, provided, however, that a cure be within the bounds of possibility.—*E. Hood Corson, D. S. T., M. E., in Our Home Rights.*

ANIMAL MAGNETISM THE CURATIVE PRINCIPLE IN HOMEOPATHIC POTENCIES.

Dr. Arthur Lutze, one of the foremost homeopaths of Germany in his day, gave explicit meaning to Hahnemann's term of "spiritual" as applied to the power resident in triturations and dilutions produced by one's own hands. Of course, homeopaths in general do not ascribe the effects of their remedies to something by them communicated. But any physician who cares to make a test will be convinced, if he proceed fairly with his experiments, that the "potencies" prepared by himself, or by the hand of one full of the homeopathic faith, will produce far better results than those made by artificial means.

I do not wholly agree with Dr. Lutze in ascribing results to "animal magnetism," but rather to a psychic force conveyed from the doctor to the patient thru the medium of the much-handled drug. To those who have no faith I recommend the experiment. There is much truth in the assumption.

Says Dr. Lutze:

"Some years ago I made the discovery, and have verified it by repeated observations, that animal magnetism is the vivifying, efficient power of our potencies. Every one who frequents my clinics has seen that the most violent pains often yield to a pass of my hand, to a breath, to a word. The zoögmagnetic power may be transmitted to natural objects, pure water, pulverized sugar, wood, etc. I have the most striking proofs, showing that a powder of sugar upon which I had breathed, or a glass of water which I had touched purposely, has produced the most marvellous effects. The thing happens in this wise: the noxious constituents of the drug are removed by attenuation; but the peculiar specific principle, which constitutes, so to say, the soul of the drug, remains, and is wonderfully excited during the shaking by the magnetic influence, and is rendered capable of curatively affecting the disordered nerves."—*Manual of Homeopathic Practice.*

MIND CURE FROM THE STANDPOINT OF THE MEDICAL PRACTITIONER.

That which follows, summarized from the *Boston Medical and Surgical Journal* of last month, is a straw showing which way the wind is blowing. Tho Dr. Edes' statements are rudimentary, and in some particulars misleading, they grant a portion of the truth for which in these pages we are contending. Old medicine is loth to admit that thot is a power capable of correcting pathological conditions already beyond the stage of functional disturbance, and accordingly seeks to limit and circumscribe its action. Yielding to the common prejudice, the Doctor clips the wings of truth when he declares that "over infections, degenerations, slow organic processes, such as control the duration of life, the general health and vigor of the constitution, psychic influence is practically nil." Experience in the psychic laboratories of life has taught us otherwise.

"Robert T. Edes considers it certain that there are many disease processes over which the mind can have no control. Such are pyrexia, anæmia, etc. Over many processes of nutrition, too, it can have little influence. Over infections, degenerations, slow organic processes, such as control the duration of life, the general health and vigor of the constitution, psychic influence is practically nil. Psychic influences comes in contact with organic processes only thru the nervous system, especially by vasomotor and secretory

nerves, and motor and sensory ones as well. The secretions of digestion are largely affected by the nerves; so are the functions of the bowels; hence, these are amenable to psychic influences. The functions of the kidneys and skin may, perhaps, be also so influenced. The intimate relations between the genital functions and mental and moral conditions are well known. So with the cardiac functions. In diseases that we call functional, the psychic influence has its greatest field. Still, in many forms of insanity, notably melancholia, it can not act. In cases in which symptoms counterfeit organic disorders, the mental healer finds his field. In neurasthenia, in which there is little real loss of nerve power, mental influences are of use; if there is real loss of nerve power this must be regenerated thru other means. Hysteria is the peculiar stamping ground of the mental healer. As to the methods of using mental healing, they are various. Suggestion may be made use of without hypnotism. The strenuous repetition of a positive assertion undoubtedly produces an effect. Many of the modern mechanical means of treatment do much of their work by mental effect, such as electricity, and various kinds of movements. As an adjuvant to the healing forces of nature and time, psychical influence will always be a precious resource to the physician."

A CONSIDERATION OF MENTAL THERAPEUTICS AS EMPLOYED BY SPECIAL STUDENTS OF THE SUBJECT.

What Dr. James J. Putnam says under this head in the JOURNAL last referred to is eminently sensible. I want to emphasize what he states to be "the problem" to be solved in the treatment of neurasthenics. Fear-thot in some form is at the bottom of all these cases. Cast it out, root and branch, from both the conscious and the unconscious thot, and health is restored; *provided, always*, that attention be given to environment and general sanitation.

"James J. Putnam tells us that some sort of specialized mental influence or education is often needed in cases of neurasthenia, aside from the improvement of nutrition. Another class of cases that may be benefited is that in which may be placed sufferers from morbid fears or occasional outbreaks of a hysterical nature. The problem is that of inducing in such patients the sentiments of courage, confidence, patience, and determination, and making them familiar with the dangers that are likely to threaten from without and within. In the class of diseases represented by morbid fears, fright psychoses, insistent ideas, and epileptiform or hysterical outbreaks, some of the best work has been done. A series of graduated efforts or one strong effort, in which the patient is supported by the physician, may overcome a morbid fear of long standing. Or such a fear may disappear before a determined attempt to go over and remember all the details of its first occurrence when it turns out to be not so dreadful after all. It has been found that painful experiences work mischief just because they are hidden from the patient's view. The hidden experience should be brot out into the clear light of consciousness. Hypnotism may be of great use here. It has been learned that it is erroneous to think that hypnotism tends to loss of independence and weakening of the will. In cases of traumatic hysteria we have examples of typically painful and insistent experiences occurring in persons not of hysterical temperament. They are peculiarly amenable to mental therapeutics. General and local treatment is also indicated along with the mental treatment. No attempt need be made to draw a sharp line between physical and mental therapeutics. A kinship exists between the influence that improves the nutrition of the brain by increasing the harmony and efficiency of its functions, and that which reaches the same end by improving the quality of its nutrient fluids, or the mode of their distribution."

Mechanical Vibratory Stimulation.*

BY GUY B. STEARNS, M. D., NEW YORK CITY.

The most recent application of vibratory stimulation in the treatment of diseased conditions depends on the presence, in the spinal cord and adjacent parts, of centers having reflex and automatic control of the different functions of the body.

A knowledge of the position of these centers and of their several functions is necessary for the correct application of this treatment. In fact, no branch of medicine calls for a more exact knowledge of the physiology and anatomy of the nervous system than does the one which is the subject of this paper.

Because of this fact I must crave indulgence if in the description of the underlying principles of the treatment I repeat much which is a part of your everyday knowledge.

The most important function of the spinal cord which relates to this subject is its power to receive impulses thru the afferent nerves and to distribute them to nerve centers, where they originate new impulses which pass out from the cord along efferent nerves to muscles, organs and other tissues, producing activities in them. This is known as reflex action. It is not simply an occasional function called into use to meet unusual conditions, but one which is continuous whether we be awake or asleep. It is the means by which the body adjusts itself to its constantly changing surroundings; to the varying degrees of atmospheric temperature. On it the organism depends for the regulation of assimilation; the carrying of nutritive material to worn-out parts, and the excretion of waste. No function of the body escapes its control, and the lines of communication between the different working parts are always busy.

In the spinal cord are the centers which control directly or through the sympathetic nerves every function having to do with the health of the body.

In order to appreciate the method by which afferent impulses are sent to these different centers, an understanding of the mechanism and distribution of the posterior nerve root terminals is essential.

Every nerve fiber as it enters the cord through the posterior root divides into two branches. One of these passes upward and the other one downward. The lower root is usually short, but the upper one is much longer, in some cases extending nearly the whole length of the cord. At intervals these two branches give off secondary branches called collaterals, which pass forward, breaking up into a terminal branch of filaments like the root of a plant, which meet and mingle with similar sets of branching fibrils connected with the motor nerve cells. Passing off from these cells into the anterior roots are their axis cylinder processes, which emerge from the cord in bundles, making up the anterior nerve roots. Before entering the intervertebral foramina, the anterior root joins the posterior, and they emerge from the spinal canal as one nerve trunk containing mixed fibers. The axis cylinder processes from the motor cells continue as individual fibers until they are distributed to the different structures whose functions they are to influence. Some pass to voluntary muscle fibers ending in a muscle nucleus or end plate, while others enter the lateral

*Read before the Massachusetts Homeopathic Medical Society.

chain of sympathetic ganglia and pass from thence to collateral ganglia, being finally distributed to the viscera.

Going back once more to the posterior nerve root we find the following distribution of its fibers. It first divides into two sets, a lateral and a central set; the lateral does not enter the gray matter of the cord at all but passes directly into one of the marginal columns, where its fibers divide and the branches pass up and down as already described. The central set passes into the post horn of the gray commissure opposite its tip, coming into contact with its cells. A portion of them go to a group of cells near the posterior commissure, sending a few thru the commissure to corresponding cells on the other side. The remainder pass forward thru the median gray to cells in the anterior horn.

Bearing in mind this wide distribution of the fibers making up the posterior root, and the fact that each fiber gives off collaterals, bringing them into relation with the intrinsic cells of the gray matter at the different levels of the cord, it is not difficult to undertsand how an impulse can pass up thru any centripetal nerve and set up a reflex action in any part of the body, involving either a single organ or muscle or any number of structures.

So long as conditions are normal these reflex actions have a distinct purpose for the automatic control of the various functions of the body both in the intensity of their action and in their relation to each other. In disease, however, they may become very erratic, setting up abnormal activities in distant parts which in turn react and send back impulses to the cord that are reflected to the original point of irritation. These may act and react on each other indefinitely until the abnormal circle of activity is broken by some outside influence.

The spinal nerves, as we have seen, contain both afferent and efferent fibers. After leaving the intervertebral foramina, each divides into three branches. One of these, the dorsal, supplies the muscles, skin and other tissues of the back; the second or ventral in a similar manner supplies the tissues of the anterior part of the body and the extremities; the third, which most concerns us, is known as the visceral branch or ramus communicans. In this the fibers are destined to make up that portion of the nervous system known as the sympathetic.

The fibers composing the sympathetic nervous system are of two kinds, gray and white, of which the white originate in cells within the cord and carry efferent impulses; while the gray transmit impulses to the cord from the organs and tissues which they supply. Part of the fibers making up the ramus communicans go directly to the lateral ganglia from which branches are passed along to the collateral ganglia that in turn send them into the organs, where they terminate either in distributing fibers or in terminal ganglia. The remaining filaments go to make up the splanchnics without entering the lateral chain at all and terminate in the collateral ganglia.

It will thus be seen that the sympathetic system originates in the central nervous system and is an integral part of it, and its fibers transmit impulses both to and from the cord exactly as do the spinal nerves.

All nerves, whether cerebro-spinal or sympathetic, carry impulses in both directions, and the resulting action depends not on the nerve but on the end organ; if it ends in a muscle, contraction occurs; if in a secreting cell of a gland, secretion results; if in the aborescent terminals adjacent to a motor cell, reflex activity of some sort.

Reviewing the different parts of the sympathetic system, it admits of the following classification; from the cranium there extends to the pelvis a double chain of ganglia located on each side of and in front of the vertebra; these are known as the vertebral or lateral ganglia. They are connected with each other by communicating fibers called the internodal branch, and with the cord by that division of the spinal nerve described as the visceral branch. They correspond very nearly in number to the vertebra, except in the cervical region,where there are but three; the superior, the middle and the inferior. In the thoracic region there are usually twelve, in the lumbar region four, and in the sacral region four or five; the two chains finally uniting in a single bundle of fibers in front of the coccyx, known as the ganglion impar.

In front of the vertebral column is another more or less complete chain, known as the prevertebral ganglia, made up of the cardiac, the solar, and the hypogastric plexuses; situated respectively in the thorax, the abdomen, and the pelvis, and composed of fibers given off from the lateral ganglia and from the visceral branch of the spinal nerves.

A third set of ganglia, consisting of minute ganglionic structures, is scattered thruout the different organs and tissues, and is known as the terminal ganglia. These ganglia receive fibers from the great plexuses, from the lateral ganglia, and from the central nervous system.

The ultimate branches of distribution derived from the lateral ganglia, the prevertebral plexuses, and the terminal ganglia supply the muscles of the vascular system, the muscles of the viscera, and the secreting glands of the different organs. Their distribution indicates their function, for they have absolute automatic control over the structures in which they terminate, and their action is either stimulative or inhibitory. Thus to the heart pass fibers known as cardio accelerators and others known as cardio inhibitors; to the blood vessels pass fibers which produce contraction of their muscular walls, known as the vasomotor nerves, and others which cause the vessels to dilate, known as vasodilators; to the involuntary muscles of the hollow viscera, as the intestines, the uterus, bladder, and so forth, pass fibers which carry impulses causing them to contract and others which cause them to relax. On these two sets of fibers depends the peristaltic movements of the intestines, stomach, and esophagus.

There appears likewise to be a double nerve supply to the glandular system, having to do with the increase and decrease of secretion.

In addition to the vasomotor, visceromotor, and secretory functions, the sympathetic system appears to have control over nutrition, certain fibers seeming to cause increased metabolism and breaking down of tissue, followed by exhaustion; while others conserve tissue destruction and increase the growth of the cells.

Glancing in retrospect over this general description of the nervous system, we find direct communication between the sympathetic ganglia and central nervous system by means of the rami communicantes; we find an intimate relation between the different ganglia thru their connecting fibers; we find in the cord an elaborate arrangement whereby thru collaterals, impulses can be distributed to different centers in the cord, and from thence reflected to different parts of the body, thus bringing into close relation every structure and every tissue. From these facts we may deduct the following

postulates and experience has proven them to be facts: first, an irritant in any organ or tissue may affect reflexly any or all parts of the body; secondly, that such irritation may travel in either direction and may originate either in the sympathetic or in the central nervous system and be reflected into the other system. A familiar example of reflected irritation is the many nervous symptoms, headache, and so forth, resulting from displacements of the uterus, morbid impulses radiating through the whole chain of sympathetic ganglia, finally manifesting themselves in these distressing symptoms, while the person suffering may not suspect the source of the trouble.

Since the primary cause may be far removed from the point where the distressing symptoms occur, we can not be too searching in our examination and inquiries if we wish to treat directly and successfully.

An irritation to any of the viscera whether due to mechanical causes, bacterial invasion, or chemical agents at once starts impulses along the sympathetic nerves and these are reflected to the proper centers for sending more blood to the irritated part. Inflammation is the result and a battle royal takes place between the leucocytes and the invading substance; ending, if the vital resistance of the body be strong enough, in a victory for the defenders, but at the cost of many soldiers and much material of war.

The excretory organs, receiving messages from the field of battle in the same manner, respond with greater activity and soon clear away the debris. Nature is proverbially lavish in responding to calls of any kind, and when replying to the calls of a diseased organ there is almost always an overflow of activity; this manifests itself usually in structures supplied by nerves originating near the point of reception of the morbid impulse.

If disease affects the viscera, the overflow of activity or impulse passes to the nearest center in the spine, is reflected to motor cells in the anterior horn, from thence thru the nearest posterior division of the spinal nerve to the contiguous muscles of the spine controlled by these nerves and produces in them contraction and congestion.

It is one of the laws of physiology that the contraction of a voluntary muscle induced by reflex irritability is maintained for some time, even after the irritation has been removed. This abnormal contraction produces pressure on the nerve filaments terminating in the muscles, acting as an irritant to them. They respond in the only way possible and send back an impulse to their centers which is reflected to the organ originally affected.

An activity having once occurred, its repetition becomes easy, the tendency being always toward its automatic continuance. If we may use the comparison, a groove has been worn in a certain portion of the nervous mechanism leading from an organ to a center, thence to another structure, back thru another center to the first tissue affected; and over this pathway is constantly flowing a stream of nervous energy that continually acts and reacts upon the structure which it influences, a constant round of nerve activity that has been aptly termed a vicious circle.

Abundant experience has proven that if sufficient pressure be applied over the contracted muscles to cause them to relax, the abnormal impulses will be inhibited, and all the involved tissues will resume their normal functions. In fact, certain phenomena relating to this phase of the nervous system have led me to believe that in many cases of reflex nerve irritability,

where a vicious circle has been established, pressure anywhere in the circle sufficient to inhibit for a time the continuance of the nerve vibrations will bring about permanent curative results. But since the spinal muscles are so easily accessible, they offer the most convenient point at which inhibitory pressure can be applied.

As an irritation from a diseased organ is usually reflected to the spinal muscles having the nearest adjacent centers in the cord, it would follow that disease of any organ would produce contraction in definite areas; and, conversely, if the muscles of any region be contracted they would indicate pretty accurately the internal organ affected. A study of the vasomotor distribution to the different organs and structures will give the necessary data for determining the regions of the spine corresponding to the various internal organs.

The spinal vasomotor nerve cells are scattered thru the anterior horns, mostly between the second dorsal and second lumbar vertebra. The upper extremities, the lungs, the bronchi and the head are supplied by that portion of the cord above the sixth dorsal vertebra. The abdominal organs derive their vasomotor supply from between the fourth and twelfth dorsal, those fibers going to the right side innervating the liver and a portion of the digestive organs, while from the left are supplied the stomach, spleen and remainder of the digestive organs.

The blood supply to the kidneys is controlled by cells in the region of the tenth, eleventh and twelfth dorsal segments. The pelvic organs have their spinal vasomotor control thruout the lumbar region, a point of especial importance being at the junction of the fifth lumbar vertebra with the sacrum.

Besides these, there are several special centers of control.

Notably: Between the eighth and ninth dorsal vertebra is a center influencing the cervix uteri. The pylorus has its center between the fourth and fifth. At the sixth is a center for the kidneys. Between the first and second lumbar vertebra is a center for the body of the uterus.

Although an irritation to an organ is usually reflected over the shortest route, and causes contraction of the nearest related spinal muscles, it does not invariably follow, for the irritation may be reflected anywhere. Where a disease has lasted a long time the continued contraction results in exhaustion and finally in atrophy. The posterior spinal processes in such a case appear very prominent, the muscles having shrunk away from them. This usually corresponds to a sclerosed or atonic condition of some of the internal organs or a general lack of systemic tone with anemia.

An irritation does not necessarily originate in a visceral organ, but may come from the spinal region and be reflected to the internal organs. The spinal muscles are not only especially susceptible to reflex irritation, but to direct stimulation as well, contractions occurring as a result of drafts, blows, etc. The reason for this is because of their peculiar duties. Every voluntary muscle is constantly on the alert to maintain equilibrium whenever an individual assumes the upright position. This is one of the automatic reflex functions of the whole voluntary motor system. The muscles of the extremities, however, are much more constantly obeying the will in making specific and definite efforts than are the spinal muscles, while the latter have fully as much as the automatic work to perform. By an effort of the will, reflex action occurring in the voluntary muscles can be repressed and in many cases abolished.

As an example of this is the patella reflex, which can not be obtained if the patient strongly opposes it. Permanent contractions of the muscles of the extremities do not occur as a result either of reflex or direct stimulation, because they are constantly responding to a higher force, the will. The spinal muscles, however, since they are called on for very little voluntary effort, but are constantly thrown under the influence of the automatic sphere, respond readily to any outside or reflex stimulation.

The muscles are not the only structures which are affected reflexly, and are factors in producing or perpetuating morbid conditions. The intervetebral ligaments may become contracted thru irritation and impinge on the nerves emerging from between their corresponding vertebra. Or, what is oftener the case, the ligaments may become relaxed, allowing the vertebra to become separated, setting up an irritation in the nerve roots emerging at that point.

Such points of separation are oftenest found at the second dorsal interspace, between the last dorsal and first lumbar vertebra, and between the last lumbar vertebra and the sacrum. Whenever such a condition is present, pressure on either side of the spine at that point will cause pain. So commonly are they present at the points mentioned, the osteopaths have designated them as weak points of the spine. The space between the sacrum and last lumbar segment is very important in relation to diseases affecting the bladder, the prostate or any part of the generative organs. The articulation is such that any deviation from the normal relation of these bones will almost invariably produce enough tension on the bundle of nerve fibers passing thru the spinal canal at this point to start abnormal impulses thru them. A very common result of such an irritation is the inability to retain the urine long at a time, and inhibitory pressure at the sides of the gap will usually entirely relieve the condition after a very few applications. The results are very gratifying to those who are obliged to relieve their bladder several times at night.

Separation below the twelfth dorsal is apt to be associated with irritation of the kidneys, as well as of the structures in the lower abdomen and pelvis. Numbness of the hands occurs with separation at the second dorsal interspace. When the condition is found at other points, vasomotor and functional disturbances will occur in the organs and tissues having spinal centers in contiguous regions of the cord.

Very often, in disease of the pelvic organs, the line of junction between the sacrum and the innominate bones will be found very tender. When such is the case a careful examination of the hip bones and a comparison of their relations to each other and to the sacrum will often show one to be slipped slightly out of place, usually up, causing a tension on the sacroiliac-ligaments.

By first applying vibration with enough pressure to thoroly relax the ligaments and muscles, and then manipulating the bones back into position, the whole line of reflex symptoms disappear.

I must give the osteopaths credit for this point, for when I was first told that one of the pelvic bones could slip on the sacrum I was decidedly skeptical. But when I studied the articulated skeleton I was obliged to admit, not only the possibility, but the great likelihood of such an accident occurring in those of relaxed fiber, from any unusual jolting or even from being on the feet a great deal. The use of the vibrator first has a great advantage over simple manual replacement,

for by first relaxing all the ligaments reduction is more easily accomplished.

In the ribs we occasionally have another source of irritation.

During violent respiratory efforts, as in sneezing or coughing, or from sudden twists or movements of the body, there may result a slight displacement of one of the ribs. This can be detected by sliding the examining hand down the back, over the angles of the ribs, and the one affected will be found more prominent than the others. If this occurs at the fourth ribs, nutritional changes take place in the muscles of the upper extremities, notably the deltoid, causing pain or even inflammation. Conversely, whenever inflammation occurs in the shoulder muscles a sensitive spot will be found at the angle of the fourth rib, just beneath the edge of the scapula. And in the majority of cases vibration applied at this point will relieve it, whether it be the result of a displaced rib or not. This point and the vasomotor area for the upper extremities are important ones in connection with professional neuroses.

Norstrom has called attention to the fact that myositic deposits occur in the muscles of the forearm in this disease, and that often by massaging them away the condition is cured. I have observed these deposits, not only in the muscles of the forearm, but even more characteristically in the infra spinatus and the latismus dorsi, near their insertion into the humerus.

Treatment over the vasomotor area of the affected arm will give much relief, but it is also essential that the absorption of these deposits be hastened. This can be accomplished by means of massage, but the process is tedious and laborious.

It is much more quickly accomplished by means of vibration applied directly to the infiltrated areas. Each area of infiltration should be carefully sought out and thoroly softened.

A displacement of the sixth or seventh ribs on the left side is always accompanied by some disturbance in the stomach, manifesting itself by acidity and flatulence. Indigestion originating in the stomach sends a reflex irritation to the back, which is felt at the angles of the ribs between the third and the seventh, on the left side. If a rib be displaced the quickest and easiest way to correct it is to place the patient face down on a table and elevate the arm of the affected side very strongly, so as to put the pectoral muscles on the stretch. At the same time place the vibrator on the angle of the offending rib, giving hard pressure, and the bone will be jarred into place. The same treatment is valuable in indigestion without any displacement of the ribs, applying the pressure successively at the angles of all the ribs in this region.

By directing the patient to drink a quantity of warm water and then inhibiting the center controlling the pylorus that structure will relax and allow the contents of the stomach to pass thru into the small intestines. Such a procedure is just as effective in the treatment of gastric catarrh as the ordinary method of lavage, and decidedly less disagreeable to the patient. Since water is so rapidly absorbed from the intestines, the volume of the blood can very quickly be increased, making this a valuable adjuvant in renal insufficiency.

The technic is simple, the patient lying on the right side with the feet drawn up, while hard pressure is applied with the vibrator at the left of the spine, between the fourth and fifth dorsal vertebra, the operator pressing firmly with his hand over the epigastrium.

In orificial work vibration accomplishes much, for by means of it the sphincter

ani can be painlessly and quickly relaxed, with none of the dangers or bad after-effects following rapid divulsion under ether. For this purpose a round rubber terminal, about four inches long and a half-inch in diameter is attached to the vibrator arm, and after being well lubricated is introduced through the sphincter while the machine is running. This treatment is one of the most gratifying in hemorrhoids, the pain ceasing immediately, while the swollen vessels seem to fairly melt away under its action.

Through the anus, also, the prostate gland can be reached, and it has proven useful in the treatment of enlargement of that structure.

The foregoing covers the rudimentary framework on which is built the theory of vibratory treatment. The finding of contracted muscles, of variations from the normal tone in other tissues and of deviations in the bony framework is not difficult. The attainment of skill in this direction only requires practice, and when once attained is as definite and exact as any method of physical examination and diagnosis at our command.

The reason why vibration is the most efficient method of mechanical treatment is because of its peculiar effect on living matter. It approaches more nearly the natural bioplasmic movements of the tissues than any other form of stimulation.

When applied moderately and for a short time it stimulates the cells, increasing growth and activity. If prolonged it causes depression and exhaustion of the cells, and finally if continued long enough disintegration and death. If given with hard pressure it inhibits activity in the tissues submitted to it. Therefore the method of application depends on the result desired.

Where there is lack of tone or deficiency of activity in any organ, gentle vibration for a short time, applied either directly to that organ or anywhere along the nervous mechanism controlling it, will stimulate it to greater activity. When the opposite condition is present, and there is abnormal activity, it can be inhibited by longer application, combined with hard pressure.

So far as I have been able to observe, the rapidity of the vibrations is of less importance than the amplitude of the stroke and the degree of pressure. It should be rapid enough so the patient can not distinguish the individual strokes, but not so rapid as to cause friction on the tissues.

Before commencing the treatment of any case, the condition of the excretory functions should be inquired into, and often the first treatment should be directed entirely to the liver and kidneys.

This can be made a general rule in conditions at all acute, for in those cases the blood is already overcharged with the products of retrograde tissue changes, and if any more be set free before the liver and kidneys are able to take care of them more harm than good will result. It is very important to bear this in mind in treating cases recovering from acute inflammatory rheumatism. Myositic deposits are found scattered thruout the whole muscular system, as well as contraction of the spinal muscles, and if these deposits be treated and broken down at once, needless suffering will result and possibly a relapse.

In diseases associated with glandular engorgement the proximal nodes should be treated in order that they may free themselves and assist in bringing about resolution in the diseased tissues.

This applies particularly to catarrhal conditions of the nose, throat and ears, and to infections of the urethra. In the former cases the glands in the neck should be stimulated, and in the last those situated in the groins.

One caution should be observed in using vibratory treatment, and that is not to treat too long, as there is danger of over-stimulation. A careful diagnosis should first be made of the condition present, and the treatment directed as specifically as possible.

All stimulation to the parts not requiring it draws just so much from the parts where the effects are desired. Ten to fifteen seconds are sufficient at any point for stimulation, and one to three minutes for inhibition. Longer is harmful or inefficient.

While patients are being treated they should be placed in a position admitting of absolute muscular relaxation. Otherwise the effects of the treatment can not be properly isolated. The prone position best admits of this, the patient lying on the treatment table flat on the abdomen, with the hands hanging loosely over the sides. The table should be long enough so the feet do not project beyond the end, otherwise the lumbar muscles will be put on the stretch, thus obscuring conditions in that region, or misleading the operator as to their true condition. The head should be supported by a small pillow, and turned so as to rest on one or the other cheek, instead of on the forehead, this position allowing of the most complete relaxation of the muscles of the dorsal and cervical region.

This same position is the best for making examinations for determining the tone and condition of the tissues, for finding sensitive spots, and for discovering deviations of the bones.

In making a survey of the body for the purpose of determining if there are any deviations from the normal curves of the spine, and for examining the contour and development of the thorax, and for observing other general points, the patient first having removed the clothing to the waist, should be seated on the table, with the feet hanging unsupported over the side and the hands hanging loosely in front.

This position brings out, better than any other, general abnormalities of the spine and thorax.

There are certain essential points in a machine for giving vibration. It should have flexibility of the moving parts, so it can be readily brought to any part of the patient's body, with rigidity enough so the vibrations are not transmitted into the hands of the operator. The part giving the vibration should have a lateral movement rather than a rotary or up and down. I have found the most efficient one to be one with the vibrator attached directly to the motor which runs it, the whole thing swinging on a many jointed arm. The flexible shafts are prone to break at critical moments and the handle of the vibrator receives too much of the movement. The stroke is apt to be uneven, thus breaking up the continuity of the impulse.

The cases I report are taken from the records of the department of physical therapeutics at Flower Hospital.

Case I—German, sixty-five years of age, Came to the clinic January 19, 1904. About six weeks before, during a very cold night, slept with his head near an open window. Next morning suffered excruciating pain over left side of head and face. This ceased after a day or two, but from that time until coming to the clinic could not open the left eye. Examination showed the following condi-

tion: The lids of the left eye were swollen and he could not open them without the aid of his fingers. On opening the lids the parts beneath were swollen and injected, the blood vessels standing out very prominently.

The cornea was very hazy. The pupil was dilated and did not respond to light. There was complete paralysis of the muscles supplied by the third nerve, the external rectus alone acting, rolling the eyeball out in extreme abduction.

Vibration was applied at the second dorsal interspace, on the left side, and over the cervical sympathetics of the same side.

Very gentle vibration was applied over the eye.

Improvement commenced with the first treatment, there being a marked decrease in the swelling and injection. After twelve treatments he was entirely cured and said he could see better than for two or three years. The improvement in the paralysis commenced at about the third treatment. As the haziness of the cornea cleared up I discovered he had a commencing cataract.

Case II—Young man aged twenty-two. Has had catarrh for many years.

During last four years has been very deaf, so much so can hear only when shouted to. Has constant noises in the ears. Constant post-nasal dropping. During last four years has treated at the different ear clinics, but has constantly grown worse. Very despondent on account of his deficiency, and often talks of suicide.

There was marked retraction of the drums and he could hear the watch at a distance of four inches for the right ear and five for the left.

Treatment was given at the seventh cervical vertebra, both sides, and over the upper and middle cervical ganglia. The glands and deep structures of the neck were also stimulated.

He has been under treatment six weeks and reports as follows:

Almost entire cessation of the subjective sounds in the ears; entire relief from the post-nasal dropping, and great improvement in hearing. By the watch test he can hear nearly double the distance he could before commencing the treatments.

I have just commenced treating two other cases for the same condition; one a young lad about six years old, who is even now showing improvement, after only three treatments; and the other a man over forty, who has been deaf for twenty years.

This is not the first time vibration has been applied to the sympathetics in eye and ear conditions, for a few years ago an English physician reported some cases treated in this way.

The object of the treatment in both the cases I have mentioned was to increase the blood supply to the parts affected, and what was fully as important, facilitate drainage by improving the condition of the proximal glands.

Case III—Carpenter, aged sixty-five. Diagnosis, multiple neuritis of rheumatic origin. Duration of disease, nine months. Cause, exposure.

Left arm helpless, right one practically so, there being only slight use of the shoulder and upper-arm muscles of that side. Had been treated by means of electricity for several months, with very little improvement. On examining the back I found a drooping of all the ribs, with marked inelasticity of the thorax, and a slight backward displacement of the fifth rib on the left side. There was marked tenderness at the angles of the ribs on both sides, from the third to the seventh.

Treatment has been applied almost entirely at the angles of the ribs in the region mentioned, working the displaced one back into position, and elevating all the others. There has been a steady though slow improvement from the start, the shoulder muscles being the first to respond. Has been given thirty treatments to date.

Case IV—This case is one of progressive muscular atrophy. The patient, a man of about forty, was for many years a motorman on the street cars. About six years ago was severely chilled, being nearly frozen. Since then there has been a gradual wasting of the muscles of the upper extremities, first appearing in the abductors of the thumbs. Now has no use of the arms or shoulders, the arms hanging as though they were useless appendages, attached by wires. The hands were swollen and blue.

Examination showed, in addition to the wasting of all of the muscles of the arms and shoulders, a marked separation between the fifth and sixth cervical vertebra. The knee jerks could not be obtained, tests with the galvanic current showed degeneration in the gray nucleus of the cord. His face was dull, and countenance heavy and apathetic. He complained of fullness and noises in the head.

Gentle stimulation was applied from the second to the tenth dorsal vertebra, close to the spine, so as to affect the vasomotor supply to the extremities, thus increasing the nutrition to the wasted muscles and to the cord. Special light stimulation was applied to the point between the fifth and sixth cervical vertebra, where the separation occurred, together with stretching and manipulation of the relaxed ligaments. The treatment to the neck relieved at once the fullness of the head and the subjective noises, and changed his whole expression to one of hopefulness. He is steadily gaining control of his muscles, those about the shoulder having increased appreciably in size. Previous to coming under this treatment he had been treated with electricity, but had steadily failed.

I have treated three cases of paralysis agitans by this method, with some improvement in each case. In all cases of this disease that I have examined, there has been extensive contraction of the spinal muscles, including the quadratus lumborum and the latissimus dorsi, and the improvement seemed to be in exact proportion to the relaxation I could produce in these muscles.

I have also used this treatment very successfully in breaking up adhesions in stiffened and anchylosed joints. The adhesions should be stretched while the vibrator is applied, as by this method they yield more readily.

Cases and specific suggestions could be multiplied indefinitely, but enough have been presented to illustrate the underlying principles, and those having been grasped, their application becomes a process of reasoning for each individual case. —*The New England Medical Gazette.*

Electro Therapy.

A Course of Twenty-four Lessons under the auspices of the Chicago College of X-Ray and Electro-Therapeutics.

LESSON 14—X-RAYS. By T. Proctor Hall, Ph.D.

Twenty-five years ago Sir William Crookes was experimenting with the newly-discovered radiant condition of matter. Up to that time three forms of matter were known, namely: Solids, in which the particles retain their relative position; liquids, in which the particles move easily among themselves, but retain distinct cohesive properties; and gases, in which the increased rapidity of motion of the particles has exchanged the cohesion for repulsion, so that the particles of the gas always fill a confined space, no matter how large it may be. Crookes discovered that when a vacuum had reached a certain point the character of the inclosed gas was distinctly altered, the particles present being so few in number that when one was electrically repelled from the kathode it passed clear across the vacuum without striking any other particles on the way, and landed upon the opposite wall of the tube. The particles shooting across in this way form the kathode stream. A tube whose vacuum is such that a kathode stream is possible in it is called a Crookes tubes. Up to the present a Crookes tube forms the only available source of x-rays.

A great deal of experimental work was done upon kathode rays by Crookes, Lenard, Roentgen and others. It was found that kathode rays travel in straight lines, that parallel streams repel each other like electrically-charged particles, that the steam is capable of doing work, such as turning a mill, that the side of the tube the rays strike against becomes hot, and when the rays are brot to a focus upon one point the glass may be melted and driven outward against the pressure of the air by the impact of the kathode particles. The stream flies from the kathode at right angles to its surface. When the kathode is dished the stream comes to a focus at a little distance from the kathode. When the kathode is convex the stream is scattered. Most x-ray tubes have the kathode dished to such an extent as to bring the stream to a focus as it strikes a platinum disc in the center of the bulb. From this platinum disc the stream is reflected almost evenly in all directions, and the reflected and scattered stream strikes the wall of the tube, causing fluorescence over that half of the bulb.

Wherever the kathode stream strikes against the wall of the tube with sufficient force, x-rays are produced. X-rays are probably produced when any solid body is struck by the kathode stream. In the ordinary tube it is still uncertain whether the majority of x-rays have origin from the platinum disc in the center of the tube or whether they are produced at the surface of the tube, where the reflected stream strikes the glass. The rays behave, so far as direction is concerned, as if they came from the center of the tube, and for radiographic purposes it is most convenient to consider the center as the point of origin, bearing in mind at the same time that irregular small kathode streams cause some x-rays to start from different points at the surface of the tube.

X-rays radiate from the tube in straight lines. They are invisible; they do not cause fluorescence in ordinary glass; they can not be deflected from their course by a magnet (differing in this respect from kathode rays), nor, indeed,

by anything, but they are irregularly reflected or dispersed by all bodies.

X-rays differ from each other in their capacity to penetrate dense bodies. This property of penetration is of the greatest importance. The rays from a tube whose vacuum is low have very little penetration; those from a tube of high vacuum have a high degree of penetration. Some x-rays are scarcely able to penetrate the skin, others pass thru the human body with ease.

The penetration of a ray may be measured by a comparison of the relative thickness of two metals of different density, which are required to give equal illumination. Roentgen employed for this purpose a platinum plate pierced with holes containing aluminum plates. The author has recently completed a penetrometer, whose essential feature is two movable metallic plates, increasing in thickness from end to end, which, upon being adjusted to give equal illumination over a small opening, gives upon a scale a number representing the penetration of the rays. The working scale runs from one to ten. Zero of the scale would indicate rays whose penetration is alike for all metals (a kind of rays which has not been found). Number ten on the scale indicates a ray which passes thru metallic tin ten times as easily as thru lead.

Nearly all of the penetrometers upon the market measure not the penetration, but a mixture of the penetration and the intensity of the ray, and are consequently worthless. It is possible, in most cases, to estimate the penetration of the rays by viewing the bones of the hand or arm. If these are dark, with clear-cut outlines, and the soft parts moderately light, the penetration is moderately low. If the bones are light, or if they are dim with indefinite outlines, the penetration is higher. But the most experienced observers are not infrequently mistaken in their estimate of the penetration of rays when they depend upon this method.

Penetration of the rays is increased by any method which increases the impulsiveness of the electrical discharge thru the tube. A moderately high electromotive force and a series of small spark gaps in the electric circuit is, therefore, advisable; but it is quite unnecessary for ordinary purposes to use an electromotive force more than sufficient to give an 8- or 10-inch spark thru air. A tube whose vacuum is so high that a current can not be produced in it by an 8-inch coil is too high for any practical use. The older Ruhmkorff coils were made to give an exceeding small secondary current, and it was necessary to use a large coil with high electromotive force in order to secure a current heavy enough for x-ray work. Coils are now built to deliver any required quantity of current and a high electromotive force is unnecessary. The intensity of the x-rays depends upon a number of factors, some of which are imperfectly understood. Of these the quantity or intensity of the current is most important, and is almost the only one which is under the control of the operator.

The rays from a focus tube scatter as they go and follow the law of all radiating forces, namely, that their intensity decreases in proportion to the square of the distance from the center of the tube. In viewing the rays with a fluoroscope the diminution in the intensity of the rays seems to be porportionate to the distance, because our perception of illumination is proportional to the square root to the intensity; but for radiographic work it is important to bear in mind the law of the inverse square.

Pathological Changes in Tissue Under the Influence of the X-Ray.*

BY WILLIAM S. NEWCOMET, M.D., PHILADELPHIA.

The subject of the pathological change in tissue under the influence of the x-ray is one of considerable latitude, and in this article it will be covered only in a general way, as detail must be avoided on account of time. In dealing with this subject in another paper, it was considered under two heads: first, the change observed in normal tissue; second, in abnormal tissue; and the conclusions reached at that time seem to still hold good. That no single form of degeneration alone is characteristic to the x-ray, and the form of degeneration observed depends entirely upon the tissue exposed and the method of x-ray application. Here may be seen the scope of this study and the cause of the great difference of opinion that exists among various authors. In some ways the effects of the x-ray might be compared to fever, as for instance in a case of high fever the first degeneration that usually takes place is a hylogranular, then, if the temperature continues, a fatty change follows. The recovery here depends upon the amount of damage done before the fever subsides. In another case, where the fever is continued for a long time with remission and intermission, we have the more chronic forms of degeneration, such as the amyloid change, etc. The x-ray is capable of the same latitude. Those who have watched an x-ray tube in operation and noticed how the vacuum will change from time to time will wonder how any constant result can be obtained, but the operator after a little practice will be able to judge to a great extent about how much energy a certain lamp is capable of giving under certain circumstances.

Then again, with this wide variance of x-ray energy, we have a still more important irregularity to consider, and that is the tolerance of the x-ray by certain individuals always being on guard for that person who has a frightful susceptibilty to unpleasant effects. And what seems still more extraordinary is the fact that a person will tolerate a certain amount of x-ray from one apparatus, while apparently the same amount from another will cause trouble. No doubt this is due to our imperfect methods of measuring the amount of x-ray energy. Some have thought that the so-called "brush effects" have a great deal to do with these unexpected results, but if this is so it seems queer that we have not seen these changes before in other fields, but this subject still needs some careful study.

The effect of the x-ray upon tissue must differ from anything else, for the reason that it penetrates to such a depth, and diverges as it does so; therefore a greater area is covered below than upon the surface, while its energy is only modified by the distance from the source, and the resistance of the intervening tissue. The question of how the x-ray acts must be overlooked for the time being, unless we accept the explanation that it is an electrochemic disturbance of the ultimate cell elements.

The inflammatory effects of the ray upon the tissues of the body have been termed a "burn." Although some objection has been raised to its use, it seems to fill the sense in this instance, just as when used for an ulceration caused by some chemical. This effect may be so slight as to cause only a perceptible reddening of the skin, followed by a faint tanning;

* Read before the American Roentgen Ray Society, Philadelphia, December, 1903.

there is very little local disturbance, with no systemic effects. From the work of some German authors in this field it would appear that this process closely resembles sunburn, but the effects are much deeper. In the case of severe burns, the process is unique in itself and differs from all other forms of degeneration and regeneration, although very irregular in its course. The period of incubation may be from a few hours to months, and during this time the patient may complain of severe pain in the affected part. In some instances the pain may be quite severe, but intense pain does not necessarily mean a severe burn; in fact what might be termed a mild burn often produces the most discomfort. The general systemic disturbance in these cases are quite as irregular but in a general way follow the course that might be expected from ordinary ulcerations in the affected part. The first observation is that of a surface hyperemia, which is followed in a few days or even longer by a slough which gradually extends over the whole involved area. Its appearance is deceptive; it looks as if it could easily be removed, but on the contrary it is quite adherent; however, after a given interval, part by part will separate and, as these pieces are removed the underlying structures have the appearance of healthy granulation tissue, but in a few days another slough will form. This process will sometimes continue for months. The appearance of the slough is like that of a bad scald, it is usually moist but differs from it in the fact that it is extremely hard to remove and will often cause intense pain. The explanation may be this, in the case of a scald the tissue dies en masse and separates en masse, while in the case of the x-ray burn the cell necrosis is only one cell at a time, the living and dead cells are intertwined, no doubt that many of these cells would recover if their nutrition was not impaired by these surrounding dead cells, and, acting like any foreign body, would also cause pain.

When the slough of an x-ray burn is carefully removed it gives the appearance of a highly magnified trabecula or a honey comb. The line of demarkation usually seen in other forms of gangrene are practically never seen here, and even when the ulceration has greatly diminished in size by healing, these sloughs still continue to form. The scars of these burns are curious, in very severe cases where the deeper structures are involved they resemble those from fire, but the surprising fact is that when the ulceration does not go below the superficial structures practically no scar will be formed and in a month or two after the ulceration has healed the skin will be as soft and as pliable as that which surrounds it.

At this point it would be well to call attention to a membranous deposit that forms over moist ulcerated surfaces, when the x-ray is applied over a long interval of short exposures, producing only a slight amount of reaction; from its appearance it would suggest diphtheria, except that it is whiter and not so dense, although when it is removed it leaves a bleeding surface. It closely resembles the slough of a bad burn, only that the membrane is entirely superficial.

As is well known, these x-ray burns are extremely painful in most cases, yet at the same time in some instances the x-ray will relieve pain, even anesthesia of the exposed part has been observed. Several theories have been advanced in explanation of these facts, but so far we have no substantial proof. In the case where anesthesia is produced after x-ray exposures where no pathological process exists, the explanation might be that there is a temporary degeneration of the terminal

nerve filaments which causes an impairment of function. This can hardly be offered as an explanation in the case where the pain is relieved in cancer, yet it will be noticed that if these cases receive too much x-ray treatment they will suffer pain, but of a different character from the pain before treatment. These facts, however, would suggest that the effects of the x-ray must be upon the cell elements in the exposed parts. In other words, when a cancer is being treated and the x-ray is applied in sufficient quantity to relieve pain, there will be very little disturbance of the part; on the other hand, when too much x-ray treatment has been given, an active inflammation follows, which involves outside structures and pain in consequence.

The study of the effects of the x-ray upon tissue microscopically in all instances offered here has been upon pre-existing disease. It has not been my fortune to be able to procure a case of simple burn, and in most instances these cases object to the knife, therefore this study is doubly tedious. Some facts have been brought forward that seem to hold good in normal and abnormal cases, but on the other hand there still exists a great deal of mystery that seems almost impossible to explain; take, for instance, a malignant growth surrounded by healthy tissue, it is exposed to the x-ray and it simply melts away, there is very little disturbance of the surrounding tissue, not only macroscopically but microscopically as well, this is well illustrated by the following cases:

Case I.—Mrs. X. for several years has been suffering from an epithelioma of the face just above the alæ of the nose; it was at the time of treatment about the size of a five-cent piece. A section was taken from the edge of the ulceration just before the first treatment, and the microscope confirmed the clinical diagnosis. X-ray treatments were given three times a week, from an 18-inch coil, on a 110-volt current, at 3 amperes, the vacuum of the tube was about 5 inches spark gap, the tube being 10 inches from the patient and time of exposure 10 minutes, the fluoroscope showed only a dull shadow of the hand. After the sixteenth treatment another section was removed from the edge of the ulceration, which at this time had healed to about one-third its former size. During the process of healing literally no reaction of the surrounding skin was produced and upon examination of the section very little difference could be seen except for some slight degeneration of the cells, otherwise it was a typical epithelioma, and a few weeks later, after the ulceration had healed, sections showed simply typical scar tissue. About the same observation was made in the case of Mr. S., which will be mentioned later.

Although in the reports of cases there is a wide difference of opinion as to the kind and degree of degeneration, many authors, however, speak of the vascular changes and most of them seem to agree that there is a thickening of the vessels, as was observed in the following case:

Case II.—Mr. P., carpenter, thirty-four years of age, spindle-cell sarcoma of the leg. About five years ago he noticed a small tumor over the tibia about four inches above the malleolus; at first it did not annoy him, but as the tumor grew it became painful. He refused a radical operation, but about three months before he began x-ray treatment, the mass was removed. At that time it was about the size of a split baseball, the wound did not close satisfactorily and recurrence was very rapid. At the time he began x-ray treatment several nodules about the size of marbles existed along the line of a very indurated and excavated scar, which was about 2½ inches long. They offered

what would seem to be an ideal case for tissue study and it was the intention at that time to remove these nodules at intervals of every two weeks, but under daily treatment they disappeared in less than three weeks and only one nodule was removed on the ninth day. The x-ray was from a 15-inch coil, 6 storage cells, a Queen tube at about a 4-inch vacuum, the tube was about 10 inches from the patient and each treatment lasted about ten minutes. It should be said here that the ultimate result was not as favorable as might have seemed, for it recurred six months later and the man discontinued treatment. The reason for removing the section before the fourteenth day was due to the great softening and diminution to almost half the original size; there was at this time considerable erythema of the overlying skin. The sections showed considerable cell degeneration with invasion of leucocytes and a thickening of the vessels with deposits on the inner surfaces. The amount of degeneration did not seem to be in accordance with what might be expected. The vascular disturbance here was rather interesting, in a part that was rapidly diminishing, the vessels were thickened and in places were almost closed by cellular deposits, yet in the other cells there was a retrograde metamorphosis. The plugging of the vessels might explain the formation of these gangrenous patches after x-ray exposures, yet if this was the only cause, the degenerating process might be expected to subside sooner than it does, at the same time we should expect other embolic complications. Perhaps these cases of pneumonia that have followed x-ray burns are due to this cause.

In another case of epithelioma of the face (Mr. S.) of thirty years' duration, sections were examined from the edges of the wound, the first section was taken after the first treatment and the other about three months later. There was very little difference between the two sections although the ulceration had closed in considerably. But while this was occurring another curious process had developed over certain areas, particularly in the deeper portions, there appeared a quite prolific growth of granulation tissue, of a pinkish color, much the same appearance that this tissue presents around tuberculous sinuses which have just been well washed with peroxide of hydrogen. Microscopical examination simply confirmed the clinical observation.

The examination of three sections from a rapidly degenerating epithelioma of the chin showed very little difference between the different sections. They were taken from the edge of the ulceration, the disease occurring in a man forty-six years of age. The x-ray in this case failed to produce any improvement, in fact it seemed to produce more irritation.

At this point it would be well to consider some of the work that has been done in this field and it will be noticed what a wide variance exists in their summaries.

Sequeira states that two definite effects from the x-rays are observed by the microscopical examination; first, a destruction of the epithelial cell, the nucleus and protoplasm undergoing lysis; in some cells there was a definite fatty change. Second, a stimulation of the connective tissue elements causing the formation of healthy scar tissue. Walker, in sections from a rodent ulcer, healing under the influence, found that a fibro-myxomatous degeneration was taking place. Beck found a colloid change in an adenocarcinoma. McCaw found the same change in an epithelioma of the uvula. Ellis summarizes from the microscopic examinations of four cases: First, necrosis of cells and trabeculæ of varying degree. In Case I there was also marked fatty degeneration,

fewer areas of lymphocytic infiltration in one case after exposure, about equal numbers in the others, a tendency to occlusion of the vessels by deposits on their inner surfaces, practically entire absence of infiltration by polymorphonuclear leucocytes.

In regard to this last point, Dr. Ellis's observations are rather interesting, from the fact that he has given this point very careful study. Mayou, in contradistinction to the above and like most other observers, found a large number of leucocytes, but differs from most others in the fact that he observed that the vessels were dilated. In another instance of a large tumor that had greatly diminished under the use of the x-ray, no change was noticed that could be attributed to its use.

Stewart, assisted by Nickerson, Wilson and Man, made an exhaustive study of a case of epithelioma of the hand and came to the following conclusions: (1) It is probable that when epitheliomata react favorably to the x-ray treatment that characteristic histological changes will be found; (2) the important early changes are fatty degeneration and vascularization of the epithelial pearls; (3) leucocytic infiltration and various degeneration processes complete the destruction; (4) bodies indistinguishable from Plimmer's bodies multiply as epithelia degenerate.

When comparing the above results we find them directly opposite to those of Dr. Ellis, and the reason is due to the different clinical methods used in the x-ray treatment. In the case of Dr. Stewart no doubt there was some x-ray reaction, that is, an over-action, while in the cases of Dr. Ellis there was no great amount of reaction. This fact will be noticed in the difference between the cases of Mr. P. and Mrs. X., and Mrs. S., and leucocytes might be looked upon to hold the following position: First, that they will be observed where we have an overstimulation of the parts by the x-ray; second, in cases that show no reaction leucocytes will not be observed. Allen, however, concludes that leucocytes are increased in the exposed areas immediately.

Some other points in Stewart's paper need careful attention. He refutes the statement of Unna that epitheliomata never undergo a fatty change, and as to the vascular changes he observes marked evidence of the formation of new blood vessels, noticeably in the centers of the epithelial pearls. His specimens showed no signs of an obliterating endarteritis.

Pernet examined tissue from a case of lupus vulgaris, which six months previous had received about fourteen treatments about ten minutes each and given daily. He found the collagium disjointed and to some extent disintegrated, the elastin had been destroyed. The hair follicles and sebaceous glands had also disappeared, while the sweat glands showed surrounding infiltration and degeneration. A large vessel in the subcutaneous stratum showed thickened walls, and in places the upper layer of the corium showed a fibrous change.

From the above observations one would naturally expect considerable disturbance of the normal tissues, when they cover some deep growth that is being treated, especially so in the case of abdominal tumors, yet in many instances have large inoperable masses been treated, until complete absorption has taken place, and with very little disturbance of the overlying skin; no doubt that some change does take place, but it never seems to lead to any grave consequences.

The opinion has been expressed by some that all cases of malignant disease should be treated until considerable reaction is observed, but this intense reaction is not necessary, for in fact, when these

cases react favorably to the x-ray they will usually do so with very little disturbance of the surrounding structures, and over reaction will only lead to a necrosis of the tissues and the healing process will be delayed while the patient will suffer more pain, in some instances it has been looked upon as the cause of recurrence of the disease. Some operators advise the use of the ray until a severe burn has been produced, with the idea that it will have a good effect in retarding metastasis; this has not proved to be so clinically and when one considers the natural history of these cases, this idea is absolutely lacking in support. When we consider the limited area treated, and then, how early and how distant these metastatic processes have been found in the normal case. Sections from the case of K. G. were made from a nodule under the right axilla, the original scirrhus was of the left breast.

Another false idea exists regarding the prognosis of deep and superficial growths, the last are supposed to be much more amenable to treatment; the fact is, however, it is not the location of the disease but the form. The natural course of a superficial skin carcinoma is often thirty years; commonly fifteen years. Now compare this with the rapid progress of a breast or gastric carcinoma and an entirely different aspect presents itself; in these cases the primary process may be treated with success when a secondary process is discovered, and in rapid succession others follow, until the patient succumbs of exhaustion. Slow-growing deep growths have done well under x-ray treatment, while on the other hand, rapid-growing superficial growths will often be irritated.

It would be impossible to review in detail all of the different phases of this subject and discuss them, but from what has been given the conclusions might be as follows: First, that no single form of degeneration is alone characteristic to the x-ray, and that the form of degeneration observed depends entirely upon the tissue exposed and the method of x-ray application; second, it would seem that the effect of the x-ray was upon the cell elements in the exposed parts, but why certain normal cells, such as those in hair follicles, etc., should be more susceptible than other tissue is still a question of doubt, but in lieu of the vascular disturbance found by many observers it might be thought that this cause plays an active part.

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American Electro Medical Society.

Titles and abstracts of papers for the meeting of this society at Chicago in December next may be sent to the chairman of the executive committee, Dr. H. P. Pratt, 1207 Masonic Temple, Chicago.

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For the weeks beginning October 3, 31; November 28.

Monday—Electro-physics, 10 to 11; electro-chemistry, 11 to 12; hydro-therapy, 12 to 1.

Tuesday—Electro-physics, 10 to 11; mechano-therapy, 11 to 12; hydro-therapy, 12 to 1.

Wednesday—Electro-physics, 10 to 11; mechano-therapy, 11 to 12; electro-diagnosis, 12 to 1.

Thursday—Electro-physics, 10 to 11; electro-therapy, 11 to 12; electrolysis, 12 to 1.

Friday—Electro-physics, 10 to 11; electro-therapy, 11 to 12; electrolysis, 12 to 1.

Saturday—Thermo-therapy, 10 to 11; electro-therapy, 11 to 12; practice, 12 to 1.

For the weeks beginning October 10, November 7, December 5.

Monday—X-rays, 10 to 11; radiography, 11 to 12; radio-therapy, 12 to 1.

Tuesday—X-ray tubes, 10 to 11; radiography, 11 to 12; radio-therapy, 12 to 1.

Wednesday—Localization, 10 to 11; radiography, 11 to 12; photo-therapy, 12 to 1.

Thursday—X-ray diagnosis, 10 to 11; high frequency, 11 to 12; psycho-therapy, 12 to 1.

Friday—Radium, etc., 10 to 11; high frequency, 11 to 12; psycho-therapy, 12 to 1.

Saturday—N-rays, 10 to 11; jurisprudence, 11 to 12; psycho-therapy, 12 to 1.

The hours of the lectures are subject to change.

Improved Board of Health.

Visitor—"You must have a remarkably efficient Board of Health in this town."

Shrewd Native—"You are right about that, I can tell you."

"Composed of scientists, I presume?"

"No, sir. Scientists are too theoretic."

"Physicians, perhaps?"

"Not much. We don't allow doctors on our Board of Health—no, sir—nor undertakers, either."

"Hum! What sort of men have you chosen, then?"

"Life insurance men."

Well, one may pertinently ask, who better than the life insurance companies has reason for taking a serious interest in public sanitation? They profit by every advance in medical discovery and progress; they toil not, neither do they spin; they sow not, but they do reap the most direct advantage from every lessening of the death-rate. It is strange that an enlightened selfishness is not recognized as their policy, if not duty.—*American Medicine.*

Errors in Diagnosis of Ureteral Calculus.

BYRON ROBINSON, B. S., M. D., CHICAGO.

In this brief note I wish to present a case which with the x-ray led to an erroneous diagnosis. A man forty-six years of age came from an adjoining State to consult me in regard to an illness which had afflicted him for some fifteen months. For the past eight months he had been unable to work. He had lost considerable flesh. Physical examination revealed no palpable abdominal lesion. Appetite was defective. Urinalysis demonstrated pus, granular casts, epithelium. Vesical inspection revealed gonorrheal cystitis of a severe type. The bilateral ureteral catheterization could be accomplished for two and one-half inches only. In drawing the catheter from the ureter the ureter grasped the catheter so firmly that the ureteral orifice followed it in the shape of a cone. A severe endo-ureteritis existed. After complete evacuation of the tractus intestinalis two Roentgen pictures were taken. Each showed three distinct shadows with definite location, dimension and contour along the left pelvic ureter. The patient was carefully prepared for operation for five days by draining the tractus intestinalis and tractus urinarius. Dr. Gustav Bergner who was in consultation during the catheterization was associated with me in the operation. I incised the abdominal wall from the public spine to the anterior superior spine of the ilium parallel with Poupart's ligament. The external and internal oblique and transversalis muscles were divided as well as the fascia abdominalis. The ureter is easily followed by securing it dorsal to peritoneum at the point it crosses the vasa iliaca. The ureter is closely applied to the external surface of the peritoneum by a few tissue fibers. It must be remembered that the ureter is nourished by a solidly compact vascular anastomosis which is formed by the renal, ovarian or spermatic arteries, the arteria ureterica media from the iliaca and the arteria ureterica distal from the uterine, as well as branches from the vesical, vaginal and hemorrhoidal. This compact vascular anastomosis extending from the proximal to the distal end of the ureter enables the ureter to be safely isolated from the peritoneum for several inches so long as the ureteral vascular anastomosis is not dis-

Fig. 1.—Cut to illustrate the common location of ureteral calculus (W, Y, Y, Z). Also P and Pa indicate the location of the phleboliths found in my case. At P two small and one large phlebolith are noted. Pa shows two small phleboliths.

turbed. The isolated pelvic ureter is thus safely palpated. To our surprise the pelvic ureter did not contain palpable ureteral calculi.

However, the problem was distinctly solved by finding in the exact location and course of the ureter indicated by the Roentgen ray three phleboliths distinct in contour, dimension and location. The phleboliths were easily located and removed. After removal they were exposed on an x-ray plate and presented shadows as definite in contour and dimensions as the original shadows. The patient made an uneventful recovery and was in good condition four weeks after the operation. The lesson to be learned in this case is that phleboliths which are not of unfrequent occurrence in the pelvic veins will cast a shadow of distinct contour, location and dimension. The phlebolith casts a shadow of more definite contour and location than the ureteral calculus. Besides, the phlebolith's shadows are liable to be bilateral though in unequal numbers on each side. Since the error produced in my case by the phleboliths Dr. Robert S. Gregg, who has performed my x-ray work in Dr. Pratt's laboratory for years, secured an x-ray from a patient with some ten shadows of phleboliths, which is also here presented. Some experience with x-ray work will enable one to differentiate between skiagraphs of a phlebolith and of a ureteral calculus. The x-ray is an epoch-making advance in the diagnosis of ureteral calculus. However, we have learned more from our error due to the phlebolith than from ten correct diagnoses of ureteral calculus.

Fig. 2.—Represents an x-ray photograph of the subject presenting pelvic phleboliths situated adjacent to the ureter distinct in contour, dimensions and location, as indicated bilaterally by the hands. These phleboliths should be reversed, the three phleboliths belong on the left side.

Fig. 3.—Represents three distinct phleboliths on the right side in a patient.

We are sorry for the inconvenience that our erroneous diagnosis caused to the patient; however, it was the price of progress.

Figures 2 and 3 are both x-rayed and diagnosed by Dr. Robert S. Gregg in Dr. Pratt's Laboratory.

The Treatment of Cancer With X-Ray.

(P. v. Bruns, Therapie der Gegenwart, No. 1, 1904.)

The results of treatment show that cutaneous cancroids and cancers of other organs differ decidedly.

Cutaneous cancroids, especially rodent ulcers, are most amendable to x-ray treatment, as results are quite favorable and the scars obtained are nicer than from any other treatment. The patients are exposed to the rays thirty to sixty minutes in three to five applications. During the first ten to twelve days the ulcer becomes darker and secretes more. After twelve to fourteen days a slight erythema of the surrounding skin develops, the hard wall softens and shrinks, the ulcer fills with granulation tissue, and soon new skin covers it from the periphery. Complete recovery occurs in four to eight weeks; however in a number of cases recurrences have been observed.

Carcinoma of deeper-seated organs so far have not been cured, but a number showed an improvement after x-ray treatment. Many cases of mammary cancer were treated with x-ray, in most of which the tumor was diminished in size and the life of patient prolonged.

The proper length of time of exposure is hard to determine, as no immediate subjective or objective symptoms of overexposure usually manifest themselves. These occur from eight to fourteen days after exposure.

The characteristic changes in cancer tissue resulting from x-ray treatment are degeneration and total destruction of the cancer cells. Perthes explains the change as a confluence of the cell protoplasm in one mass with vacuoles, and the nuclei degenerate. Cell infiltration and new connective tissue invades the cancer tissue from the periphery and gradually replaces the cancer cells.

Scholz's experiments of x-rays on normal skin show that the epithelial tissue is primarily affected and degenerates, while the connective and other tissues suffer much less. Cancer cells are more sensitive to x-rays than are normal epithelial cells.

The author concludes that the majority of carcinomata are not benefited by x-rays, that subcutaneous carcinomata are benefited by x-rays, and that cutaneous cancroids are cured by x-ray.

The technic must be improved so deeper-seated tissues can be reached. Only such cases should be treated with x-rays in which no harm would be done by postponing a surgical operation, i. e., the most favorable and unfavorable cases, and rodent ulcers. Inoperable mammary carcinoma are benefited, as the pain diminishes, the odor is less offensive, and the tumor grows less quickly.—*Med. Fortnightly.*

The Bloodless Treatment of Phimosis.

(Gerson, Therapie der Gegenwart, February, 1904.)

The prepuce is pulled over the glans with left index finger and thumb, after which a dull pincette with closed branches is introduced into the sack. The pincette is permitted to spring open, which dilates the prepuce. This process is continued for one-half to two minutes daily, and in several weeks a cure is produced. The mother is instructed to dilate the sack twice daily by pulling prepuce apart with index finger and thumb of each hand. This method is available only in infants and children.

Some of the Physical Properties and Medical Uses of Radium Salts; with Report of Forty-two Cases Treated by Pure Radium Bromid.

Francis H. Williams, *Medical News*, February 6, 1904, states that radium has five properties that especially deserve notice: (1) It maintains a temperature above its surroundings under thermal insulation; a temperature of 1.5° C. has been observed. (2) It is luminescent. (3) It is a spontaneous source of electricity. (4) It gives out three kinds of rays, named by Rutherford, alpha, beta and gamma. (5) It produces in surrounding objects "induced radioactivity," or "excited radioactivity." This imparted radioactivity is caused by an emanation. The emanation, which is thought to be a gas, imparts radioactivity to objects that have been in the neighborhood of radium salts for a sufficient period: that is to say, these objects, even after removal from the radium, give out rays for a certain length of time. On account of their inability to show sufficient differentiation between the tissues, the rays from radium, unlike the x-rays, can not be used for diagnosis, or prognosis, either by means of radiographs or of the fluorescent screen. Therefore for these purposes they can not replace the x-rays. The use of radium salts for therapeutic purposes needs much the same kind of experience as is required for the successful therapeutic use of the x-rays. Already a number of cases of injury to persons working with radium have been reported. Radium should be kept in a metal box or capsule with a thin mica front or other suitable covering, so that the radiations may be cut off in all directions except that in which the practitioner desires the rays to proceed. To such a capsule the writer has attached a long, flexible handle, in order to hold the radium at a distance when applying it. This handle is a protection to the physician. When not in use, the capsule should be placed in a thick lead box or tube, so that the radiations may be absorbed. An over-exposure may cause a burn, which may not become evident for some time. Exposures differ for different diseases, even superficial ones. Consequently experience is necessary to judge of the proper length of exposure and of its frequency. In conclusion the writer says that his experience thus far teaches him that there is much similarity between the action of the radiations from radium and the x-rays; that if the results obtained by radium prove permanent, this new therapeutic agent will be largely used instead of the x-rays, but that the two will supplement each other. Certain diseases promise to yield more readily to treatment by radium and others to the x-rays. A disease that has attacked different parts of the body of a given patient may be better treated in certain regions by radium and in others by the x-rays. It is quite possible that in some cases the two remedies used together on the same area and at the same sitting may accomplish better results than either alone.